Easton Roller Mill
Junction of State Roads 73 and 119
Morgantown
Monongalia County
West Virginia

HAER No. WV-4

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

REDUCED COPIES OF MEASURED DRAWINGS

HISTORIC AMERICAN ENGINEERING RECORD

EASTON ROLLER MILL

WV-4

Location: 300 meters from junction of State Roads 73 and 119, Morgantown vicinity (Easton), West Virginia
MORGANTOWN NORTH QUAD: 17.593275.4389275

Date of Construction: c. 1870

Present Owner: Monongalia Historical Society

Present Use: Museum

Significance: Conversion to roller mill production in 1890 allowed this rural mill to meet the demand for the new, whiter "patent" flour. An interesting case to technological change in response to social forces.

Historian: Dennis M. Zembala, 1975

The history of the Easton Roller Mill near Morgantown, West Virginia, provides an insight into the pattern of settlement of a region which was, at the time of the Civil War, only one step removed from wilderness. Originally, Easton Mill was both a sawmill and a grist mill and illustrated the close relationship of lumbering and milling in a frontier environment. By sawing their timber and grinding their grain, the mill satisfied two very basic needs of early settlers in this region (WV-4-2). The first mill at Easton was built about 1870 by Henry Koontz, a local resident. The interior timber framing indicates that the original building measured approximately 30x52 feet, terminating just beyond the location of the existing set of burrs (see HAER drawing of plan. Sheet 2 of 4). Although there is some possibility that it was originally a water mill (a small stream flows nearby), a steam engine became the prime mover at an early date. By 1883, it was described as a large steam mill with a capacity of 120 bushels per day,[1] indicating that the engine was used to run two or possibly three sets of stones in addition to the sawmill. The portion of the main structure which houses the engine and three floors of machinery above it were probably added soon after the initial building. If, indeed, the steam engine was the original prime mover, it could very likely have been housed in an adjacent structure or a shed addition as was common at the time. Casualties due to boiler explosions and faulty steam fittings were frequent and it would be some time before men would really feel comfortable in the same room with one. Probably contemporary with this addition was the sawmill shed, the roofline of which may still seen on the exterior of the southern elevation.

The expansion of agriculture in this area coincided with a revolution in the technology of flour milling. As a result, the Easton Mill is quite significant as an artifact of the transition of the trade from small "custom" mills to large-scale industrial organizations.[2] In an earlier period, this expansion would have meant that other small water-powered mills would have been built near those already on the nearby Cheat River. The extension of farming into formerly unsettled areas would have meant the proliferation of mills in those areas since the farm population was not only the producer of grain but also the major market for flour. A series of innovations in the later 19th century destroyed that pattern, so that by the 1930's, the small custom mill was virtually eliminated from the flour business.

The changes in flour milling technology which occurred from 1870 to 1910, transformed the industry into one characterized by large, urban complexes. The state of milling in 1870 was essentially the same as it has been since Oliver Evans' system of elevators and conveyors made the small water-driven mill a one or two man operation.[3] From 1790 until the invention of the roller mill in the late 1870's, innovation in flour milling consisted of the elaboration of Evans' designs. Automation made

possible the construction of larger mills such as those in Richmond (Hauxall) and Minneapolis, but the grinding process was essentially unchanged. Grain was still ground with stone burrs set close together to produce as much flour as possible in one "run". The product of this grinding was then run through a "bolter" which separated the finer particles (flour) from the coarser (middlings) and the coarser from the chaff (tailings).[4] In 1870, Edmond LaCroix, a French immigrant employed at the Washburn "B" Mill in Minneapolis, began a series of experiments to develop a more efficient purifier for the separation of these products. LaCroix, working under conditions of utmost secrecy, built a purifier for the Washburn Mill based on the design of a French machine patented in 1860. Until this time, the middlings had little value and were used to make coarse ship's bread or porridge. The new purifier allowed them to be efficiently separated from the bran and reground. The resulting flour was highly superior for baking bread and was labeled "patent" flour. The superior risibility of patent flour encouraged the acceptance of the so-called "New Process" milling technique in which the stones were set high (far apart) to obtain the largest possible amount of middlings. The elaboration of this process led to what is called the gradual reduction process in which the grain might be ground as many as seven or eight times, being run through a purifier after each grinding. Unlike the old process, the object of the first grinding was now to produce as little flour as possible. The stones were set far apart, eliminating, to a large extent, the heat of friction which formerly discolored the flour and reduced its rising ability.[55]

The next step in the milling revolution was the adoption of the Hungarian system of using rollers instead of stones (See HAER Photo WV-4-). This innovation was encouraged by the new process of gradual reduction where the object was to granulate the grain instead of pulverizing it. In addition to taking up less space, the new roller machines were ideally suited to the object of producing a large proportion of middlings. In the first reduction, the grain was passed between two cylindrical rollers of chilled iron (early experiments with ordinary iron and ceramic rollers proved unsuccessful) and twisted until it cracked, thereby separating interior, starchy portion from the hull (chaff) and the germ. After separation, the former was reground. Each successive purification eliminated more of the undesirable parts and produced flour and middlings. The final result was flour of the highest quality. The first all-roller mill was supposedly that built for C. C. Washburn in Minneapolis in 1878. By the late 80's, it was the most common system for new mills throughout the country.[6]

The largest impedance to widespread acceptance of the New Process was its increased demand for power. For small mills on country streams, the operation of a hank of roller mills and a number of purifiers, each

with its appropriately-sized sifting cloth (WV-4-12, WV-4-13), was out of the question. For this reason, initial acceptance was limited to areas like Minneapolis which had plentiful supplies of water power. Those less fortunate, however, were quick to develop alternative sources and to take advantage of the new techniques.

The three basic solutions to this increased demand for horsepower were: the use of steam as motive force, the use of large wrought-iron water wheels, and the replacement of the water wheel by a water turbine. The selection of one of these depended on the amount of water available and the size of the mill. Where water was plentiful, the most practical solution was either a large wrought-iron water wheel or a turbine, both of which had an efficiency of near 80%. Where water was scarce or erratic or the anticipated mill was large, steam was the only answer.

The sequence of improvements at the Easton Mill suggests some crucial problems in the adaptation of steam power to flour milling; also evident is its importance to subsequent innovation. During the period from 1860 until 1880, compact, dependable steam engines became increasingly more available. Due to the railroads and steamboats, the basic principles of steam power were becoming more widely dispersed and accepted as conventional knowledge. Gradually, steam engines proliferated in function until they were, by 1870, adapted to any number of operations, e.g., machine shops, factories, sawmills, oil-well drilling and pumping. By the time they came into use in flour milling, many of the problems had been eliminated. Yet, it remained for millwrights in the 1870's and 80's to harness this new motive potential to run existing machinery. If, for example, the present engine at Easton (WV-4-5, WV-4-6) dates from the early 1870's, its power was undoubtedly more than adequate for the operation of two run of stone burrs and a sawmill. Consequently, its efficiency in terms of fuel consumption was rather low, leading us to conclude that its procurement and installation was probably not well-planned. More likely than not, Koontz or William Anderson, who owned the mill from 1876 to 1883, bought the engine as a surplus item - perhaps in the nearby oil fields of Pennsylvania. Installation was not quite as simple since, at the time, the great majority of flour mills in the country were water driven. The problems of adequate and appropriate shafts, belts and gears had not yet brought forth any standard solutions. Even as late as 1924, milling handbooks continued to include plans for building and installing water wheels and turbines in their sections on motive power.[7] Just how the miller at Easton adjusted the power of the engine to the original grinding machinery is unknown. Two things are certain, however: one, that he had great difficulty in maintaining a trouble-free system, and two, that the amount of horsepower available was in excess of the amount required to run his machinery. The relatively high speed of the drive wheel meant that a large amount of transmission hardware would be needed

to match it to the relatively low speed of the stone burrs (see Photo of Shafting WV-4-7). Failure to do so meant that heat from friction would unduly wear down the stones and lessen the quality of the flour. The miller probably learned these things from experience and, as a result, became something of a mechanical engineer in the course of pursuing his craft. In general, as more machinery was added to the milling process, the technical demands on the miller became greater.* Eventually, such demands would make it impossible for one man to handle all aspects of the operation of a mill.

In retrospect, the excess of horsepower at Easton was fortuitous. The power available and the existence of some transmission hardware greatly facilitated and probably encouraged the installation of roller-mill machinery. When Isaac Morris put in the roller process at Easton in 1894, the superiority of the gradual reduction process had been proven (WV-4-8). The consumer demand for middlings or "patent" flour was expressing itself in the marketplace in terms of higher prices. In a rural area like Easton, a roller-process meant not only higher prices but more business. By 1885, one writer could proclaim an end to the period of rapid innovation and the beginning of a steady increase in the number of roller-mills in operation. "The time is past," he declared, "when a miller has to sustain his position by his ability to make changes in keeping with the spirit of revolution which was once so prevalent." Instead, he foresaw the refinement and dispersal of these techniques. By the time Morris decided to modernize his mill, the technical expertise needed to set up and run the machinery for a gradual reduction process had risen above the level of the competent country carpenter and blacksmith. Aside from the problems of harnessing a new prime mover, the additional machinery necessitated a complex system of elevators to carry the grain through the many stages involved (WV-4-14). The power needed for each machine had to be calculated and the machine fitted with its appropriate belt and pulley. The shafts had to be balanced and hung true to eliminate vibration. Finally, all had to be integrated to run together at maximum efficiency. The fact that the roller mills at Easton and a good deal of the other machinery was acquired from the Indianapolis, Indiana, firm of Nordyke and Marmon indicates that Isaac Norris himself did not have such expertise. Nordyke and Marmon[8] were millwrights and mill builders as well as suppliers of equipment. It was common for such firms to contract for the supply organization and installation of mills like Easton. Working under a license from various patent-holders, they produced the machinery, installed it, and sent a factory-trained miller

* The proliferation in the late 19th century of journals devoted to the flour milling industry indicates the great need for technical information in the profession. See: Northwestern Miller, American Miller.

to instruct the owner in its operation. Such firms employed numerous miller-salesmen who canvassed backwoods areas in search of business. This situation, reinforced by competition between designs and frequent patent litigation, probably had much to do with the rapid spread of the new process.

Although the process took the country by storm, there is a good indication that it was not, however, a tidal wave. The persistence in the present century of water-powered stone burr mills attests to this fact. Even as recently as twenty years ago, such mills could be found in rural areas throughout the country.[10] The success of the new process was, after all, dependent on the demand for whiter flour which produced a highly-risen, airy loaf of bread. Such a change in taste is of an arbitrary character. In more traditional rural areas, changes occur slowly, if at all (in an anthropological sense, the high value placed on traditional ways of doing things is really what defines a "folk" culture). In any case, it is quite likely that acceptance of the new process in milling was never as inevitable as the above quote suggests. Rather, the installation of a mill such as that at Easton depended on a combination of factors more sociological than technical. These factors were taken into account by Isaac Norris when he finally decided that the trouble and expense of changing would, ultimately, be worth it. A large factor in the success of his operation was the recent development nearby, of a relatively large community susceptible to persuasion that, white, light bread was somehow better than what they had been eating.

From 1865 until World War I, nearby Morgantown, West Virginia, grew from a sleepy little river community to a rather large, diversified town. The several factors involved in this growth brought in a diverse population which made Morgantown, on the whole, a more cosmopolitan center than the surrounding area. Its situation on the Monongahela River meant that, even before the war, it had become a market center with a river connection to Pittsburgh. Various small industries had developed to supply the surrounding agricultural region with manufactured goods. Among these were a foundry, a pottery, a paper mill and a steam-powered wagon factory. In addition, there were numerous retail outlets for goods brought in by steamboat, e.g., clothing and furniture.[11] In 1864, Morgantown was designated by the legislature of the new State of West Virginia as the site of the new state university. Together, these factors made Morgantown the logical center for the subsequent industrial development of the surrounding area. It provided a pool of qualified labor (clerks and managers) and housing and supportive services for the new population which that development attracted.

Morgantown's greatest period of industrial expansion coincided with development of nearby coal and oil deposits. From 1885 until World War I, the growth of supportive facilities for these industries wrought

great changes on local patterns of culture.[12] Railroad and telegraph connections were made with the major industrial centers of Pittsburgh, Baltimore and Philadelphia. The availability of coal and gas for fuel attracted new industries, particularly steel and glass. In general, development brought with it a whole new range of occupational roles and their corresponding cultural patterns.

While we must be careful not to over-organize, some tentative conclusions may be drawn as to the effects of such changes on an enterprise like the Easton Roller Mill. The acceptance of the roller process was, after all, dependent upon two factors: the exposure of the miller to its existence, either through literature or from millwright representatives, and, two, the local demand for a flour which made white, light bread. Consequently, the success of the mill from 1894 until 1930 reflects the changes in the town itself during the period. For a variety of reasons connected with its development, Morgantown was more amenable to national trends (at least in bread consumption) than were the surrounding rural areas. During the period when the location of mills was greatly influenced by grain supply the roller mill process was even more closely circumscribed by the susceptibility of local markets to national tastes. In many rural areas, mills were unaffected until the appearance of electronic communications and modern transportation. The former created the demand, but the latter made the location of industry independent of grain supply and markets.[13] When W. C. Ley and Frank Walls tried to re-open the mill in 1939 (it has closed in 1930), they found that local farmers no longer produced grain and that most people bought their flour at the grocery store where they could choose one of several nationally-marketed brands.[14]

FOOTNOTES

1. Samuel T. Wiley, History of Monongalia County, West Virginia (Kingwood, W. Va., 1883), p. 676.

2. Louis H. Gibson, Gradual Reduction Milling (Minneapolis, 1885); R. James Abernathy, Practical Hints on Mill Building (Moline, Ill., 1880), part 2, pp. 173-298; Charles B. Kuhlman, The Development of the Flour-Milling Industry in the United States (Boston, 1929).

3. Oliver Evans, The Young Mill-Wright and Miller's Guide (New York, 1972 [1790]).

4. Ibid, pp. 255-283.

5. Kuhlman, p. 120.

6. Ibid, p. 122.

7. See, for example, Benjamin W. Dedrick, Practical Milling (Chicago, 1924) pp. 371-498.

8. Gibson, p. 57.

9. The Northwestern Miller, Vol. 33, No. 1 (Minneapolis, 1892). See page 12 for Nordyke and Marmon Advertisement.

10. Harry B. Weiss and R. J. Sim, The Early Grist and Flouring Mills of New Jersey (Trenton, 1956).

11. James M. Callahan, The History of West Virginia, Old and New (Chicago, 1923) pp. 139-143.

12. Callahan, p. 551.

13. Kuhlman, pp. 205-206.

14. Harvey Brooks, "Easton Roller Mills," Monongalia Chronicle, Vol. I, No. 1 (Jan., 1972).

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